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THE TRIAD: A VIABLE ENTITY FOR THE 1990S?

BY

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THE TRIAD: A VIABLE ENTITY FOR THE 1990s?

AN INDIVIDUAL STUDY PROJECT

by

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ABSTRACT

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The triad, consisting of land-based strategic bombers, land-based Intercontinental Ballistic Missiles, and sea-based Submarine Launched Ballistic Missiles, has provided the U.S. a nuclear deterrent umbrella for over 30 years. All three of the systems have been refined and updated over the years, but the basic strategy of a three legged deterrence has not been altered. Now, that the cold war has been declared over, and the USSR appears to be disintegrating as a major force, the question becomes, is the triad still required to provide for the security of the U.S.? This paper first traces the beginnings and evolutions of the triad weapons, and the strategic nuclear policies the U.S. adopted to take advantage of the enhancements technology produced in the weapons. Each member of the triad is then examined separately to ascertain weaknesses and strengths. Following this individual study, the combined effects of the systems and how they compensate for weaknesses in other weapons is discussed. The conclusion reached is that the triad remains a vital part of the United States' security, and should remain in existence until such time that total world peace can be assured.

INTRODUCTION

"Preparedness never caused a war, and unpreparedness never prevented one." Congresswoman Florence Prag Kahn 1930.[1]

For the 45 years of the nuclear world, the United States has subscribed to the above principle and has based its security on the belief that preparedness would deter any potential enemy from attack. This policy has become to be labeled deterrence. Deterrence being the concept that if the nation possessed and seemed willing to use an arsenal of nuclear weapons, the enemy would not attack for fear of unfathomable consequences. This policy has passed the test of time, for every American administration, both Democratic and Republican, since 1945 has subscribed to its theory and continued to reinforce the concept.[2]

But, deterrence would be a hollow threat without the necessary, demonstrated military force to enforce it. This force must be credible to all who view it, and must be backed by the perception of potential aggressors of the will to use it if provoked. As reported by the President's Commission on

Strategic Forces, headed by then former, and now once again current, national security advisor Lt Gen Brent Scowcroft, USAF (Ret.), "Deterrence is not and cannot be bluff."[3] The strategic triad has provided the deterrence the citizens of the United States felt they needed for all of these 45 years, and it too has won the support of every administration and congress in its long life.

This paper will examine the strategic triad by first discussing the background that led to the development of such a deterrence system. After examining the term triad we will explore the concept in more depth by discussing the details of the three legs of the system, the Bombers, the Intercontinental Ballistic Missiles, and the Submarine Launched Ballistic Missiles, separately, to recognize the advantages and disadvantages of each.

The paper will conclude with an analysis of the data presented on the members of the triad, and discuss how the systems interact with each other. Conclusions will be offered based on this analysis to determine the usefulness of the system to the future security of the United States as the nation is confronted by a drastically changing world situation.

This paper will examine the strategic triad of the United States only. The Union of Soviet Socialist Republics has also

relied on a triad of strategic nuclear delivery systems to deter aggression, but though their reasons for developing such a system and its inherent advantages and disadvantages are similar to those of the Unites States, the scope of this paper will be limited to discussions of the United States' system.[4]

BACKGROUND

The Weapons

When the nuclear world began in July 1945, with the bombing of Hiroshima and Nagasaki, there was only one way to deliver a nuclear weapon. The only delivery system capable of carrying the large, heavy (over five tons), early nuclear weapons was the then state of the art, large, slow by today's standards, B-29 bomber. The shear size and weight of the early nuclear devices limited the method of delivery to the very largest of the available bombers and even these could only carry a single weapon for a number of years.[5,6]

As technology advanced following World War II, the size and weight of nuclear weapons was reduced, while at the same time advances were made in the capabilities of aircraft. Guided missiles also underwent drastic technological development which

made them a competent delivery method as well. These advances allowed the existing delivery system to expand to include first Intercontinental Ballistic Missiles, and later Submarine Launched Ballistic Missiles.

Strategic Bombers:

The 1940 design, piston engined B-29, was joined in the strategic bomber inventory of the U.S. by the faster, further ranging, increased payload capable B-36 in 1948. The B-36 was in fact the first truly intercontinental range bomber with its 10,000 mile range.[7] The B-36 was itself surpassed in performance in 1951 by the introduction of the B-47. The all jet engined B-47 was a quantum leap in technology, which produced vast increases in both range and particularly speed over earlier piston engined bombers.[8] All of these early generation aircraft were phased out of the active inventory as age and technological advances limited their usefulness.

The next aircraft to appear on the scene was the venerable B-52, designed in 1946, first flown in 1952, and operational in June 1955.[9] The B-52 greatly improved both the range and payload capability of the bomber fleet, and its design capabilities are proven by the fact that it is still the mainstay of the United States' bomber force. The B-52 was joined

for a time by the supersonic B-58, but outlived the "designed ahead of its time" "Hustler".[10,11]

The fleet of strategic bombers was joined by the FB-111A in 1969. The swing-wing strategic FB-111 is being converted into a tactical F-111G and will lose its strategic mission by 1994.[12] The B-1, initially canceled in its "A" model configuration by the Carter administration in 1977, was resurrected, in a much revised "B" version and became operational in 1985 as an aircraft to "bridge the gap between B-52s and B-2s."[13,14] While the bombers were being improved, more advanced guided missiles were also being developed.

Intercontinental Ballistic Missiles (ICBMs):

The first U.S. missile capable of delivering a nuclear war head a sufficient distance to be of any use was the _GM-16_ Atlas series of missiles which were developed in 1954-55 and became operational in 1959.[15] While these early missiles did allow the U.S. to expand its method of delivering nuclear weapons, they were hazardous, and expensive to maintain because of their liquid fuel. They were also quite unreliable because of their complicated mechanics and early electronics, and suffered from limited range and reliability when first introduced. The accuracy of these early missiles also left something to be desired.[16]

The next series of Intercontinental Ballistic Missiles to be developed was the _GM-25_, Titan family. This group offered increased range, payload, and reliability over the ea.ly Atlas' but continued the drawbacks of liquid fuel.[17] The Titan family was deployed in a nuclear role from 1962 until 1987, when the Titans were removed from alert duty.[18]

Throughout its short history, the United States' ICBM fleet has been dominated by the LGM-30_ Minuteman group.[19] These missiles, like the B-47 bomber, were a major step forward in technology, with their solid fuel, improved guidance systems, and on later Minuteman III versions three independently targetable re-entry vehicle warheads.[20] The latest ICBM to be fielded by the U.S. is the LGM-118A Peacekeeper. Fifty of these more accurate weapons with 10 independently targetable re-entry vehicles became operational in 1986.[21]

Submarine Launched Ballistic Missiles (SLBMs):

While the ICBM and bomber were being rapidly advanced by technology, the Submarine Launched Ballistic Missile was being developed. This strategic delivery system was first introduced by the Union of Soviet Socialist Republics in 1958, followed by the U.S. in 1960 with the Polaris SLBM.[22] The Polaris in its three versions was the only U.S. SLBM until The Poseidon was

deployed in 1971, and even with the MIRVed Poseidon available, the Polaris remained an active SLBM with the U.S. Navy until its phase out in 1982.[23] The newest of the U.S.'s SLBMs, the Trident, first joined the fleet in 1979, and is still being produced as the increased accuracy Trident II D-5.[24]

Nuclear Doctrine

The United States' policy for the use of nuclear weapons to provide security has changed numerous times since the first and only war-time use of nuclear weapons in 1945. Some of these changes were made by a conscious decision, while others were forced upon the leaders of the nation by technological changes or by actual or perceived changes in the political or military posture of the Soviet Union.

Monopoly

The monopoly on nuclear weapons the U.S. enjoyed from 1945 until the first Soviet nuclear detonation in August 1949, was sufficiently supported solely by the bombers.[25] As this was an uncontested time for the nuclear supremacy of the U.S., no real master plan was developed, and no other delivery system was required.[26] But, the Soviets soon demonstrated their intent to build a nuclear arsenal, and the U.S. was forced to abandon its thinking that nuclear planning was simply an extension of strategic bombing as used in World War II. This early planning

had focused entirely on industrial type targets and regarded the Soviet long-range forces as not posing a threat to the U.S. [27] The nation's answer to the loss of its position as the sole possessor of nuclear weapons was to enhance its nuclear posture and alter its thinking on their usefulness.

Massive Retaliation

The new, and in reality first, nuclear policy of the U.S. became known as "Massive Retaliation". The idea of Massive Retaliation dominated the United States' nuclear thinking from the late 1950s until 1961, and for the first time addressed targeting Soviet population centers, as well as industrial and military control centers.[28] The development and fielding of the ICBM in 1959 supported this planning and gave the U.S. the edge once more in nuclear power, with two separate, independent delivery systems. The Massive Retaliation policy remained in effect until after the Soviets introduced the SLBM, and the U.S. followed closely with its own SLBM.

Flexible Response

The development of more advanced delivery systems allowed the United States' national command authority greater latitude in choosing the nuclear strategy it felt would provide necessary security. This planning evolved into the idea of maintaining

the ability to strike selectively, rather than massively, and came to be known as flexible response.[29] Flexible Response remains with us today, under several sub-titles such as "Strategic Sufficiency", and "Essential Equivalence", but all basically support the same philosophy.[30]

Thus, the strategic triad of bombers, ICBMs, and SLBMs, was not developed to support the nuclear policy or doctrine of the nation's leaders. It, rather came about as a result of advancing technology, which allowed the fielding of ever more sophisticated weapons, which served to permit the U.S. to expand its security options.[31] Many argue that this is the classic case of "gadgets" being sold through the bureaucratic process which end up shaping the policy of the U.S.[32] But, history has proven the worth of the triad, and the "gadgets" that have served to make it a viable force have allowed the nation to expand its options and have kept the world at peace for over 45 years.

THE BOMBERS

Before discussing the role of the bomber in the nuclear triad, a suitable, commonly agreed upon definition is in order. Such a definition is, unfortunately, quite elusive. One would

think that with all of the time and effort expended on the Strategic Arms Limitation Talks (SALT), The Intermediate-range Nuclear Forces (INF) Treaty, and the Strategic Arms Reduction Talks (START), a satisfactory definition would have been developed--such is not the case. As an example, the definition rendered in the SALT II documents discusses "Heavy Bombers" (note: not strategic bombers) as:

> . . . considered to be:
> (a) currently for the United States of America, bombers of the B-52 and B-1 types, and for the Union of Soviet Socialist Republics, bombers of the Tupolev-95 and Myasishchev types:
> (b) in the future, types of bombers which carry out the mission of a heavy bomber in a manner similar or superior to that of bombers listed in sub-paragraph (a) above; . . .[33]

This type of vague wording compounds the difficulties of not only the treaty negotiator, but also the student of the subject, both of whom would logically be expecting a finite definition in, for example, un-refueled range or payload capability. A point of interest here is that this definition does not address weapons systems such as the U.S. FB-111 or the Soviet Tu-26 Backfire as strategic bombers, even though their primary tasking is as nuclear delivery vehicles.[34,35] In the interest of

conformity, this paper will also discount these medium bombers from the discussion of the nuclear triad.

Advantages of the Bomber

The only charter member of the triad retains many of the strategic advantages that allowed it to be the only delivery system the U.S. required for many years. Over the years, and especially in the later years, there have been many who thought the bomber leg of the triad was obsolete, passed over by the technology of the guided missiles. Many now doubt this claim, and recognize the unique and essential role the bomber plays in the strategic defense of the U.S.[36]

Advantages the bomber offers to the triad over the other two delivery systems are many and varied. Some of the major advantages include: The bomber is the only part of the triad that is truly recallable. Bombers can be launched from their home bases at the first sign of a confrontation and stopped by the national command authority before they enter enemy airspace or deliver their weapons.[37] This of course makes them a much more flexible weapon than the other members of the triad, which once launched are un-controllable.[38] This feature also allows the bombers to be used to show national resolve, by being launched in time of international tension, without any danger of

actually delivering a nuclear weapon without receiving the properly authenticated "go code".[39,40]

Bombers are also re-targetable, either enroute to the target area by the national command authority as priorities change, or by the "man in the loop", once at the target.[41] This feature, unique to the bomber, allows the bomber crew to take full advantage of the situation as it presents itself at the instant of attack. It would allow, for instance, the attacking of an alternate target, if the primary one has already been destroyed, or has moved.[42] This feature also enhances the bomber's ability to strike mobile targets, a capability not found in the other two legs of the triad.[43]

The bomber also has a unique affect on the potential enemy and his defensive plans. The threat of a bomber force causes the enemy to expend effort and resources on an air defense system to combat the threat. This system, which is wholly defensive in nature, does not threaten the U.S., and it in effect drains resources away from more threatening offensive weapons.[44]

Nuclear delivery systems must also be looked at from the perspective of what expected future treaties and other imposed limitations will have on their future. In this category, the bomber enjoys an advantage, as wording in the soon to be signed

START will contain the so called "bomber discount rule". This clause means bombers are not counted by the total number of nuclear weapons they can carry, as are ICBMs and SLBMs, but count only as a single warhead.[45,46,47] The reasoning behind this decision is that bombers are considered less "destabilizing" than the other two legs of the triad because of the time it takes them to get to a target (hours instead of minutes), and their recallability.[48]

Disadvantages of the Bomber

While the above arguments may make the bomber sound like the system for all seasons, it does have drawbacks and limitations, some of which have caused many in the U.S. to advocate completely abandoning the bomber as a strategic system.

One of the major concerns of those involved in strategic thought about the bomber's usefulness as a delivery system is the possibility that it may now, or soon be unable to penetrate the Soviets Union's formidable air defense system.[49,50] This point, of course, is the basis for the current debate over the requirement for the B-2 bomber, which is being developed to accomplish the penetration role into the 21st century. As Representative Les Aspin stated: "The B-2's ability to penetrate Soviet air defenses and reach its targets is both

central to this debate and of the highest classification."[51] This debate, with its suppositions and security classifications, is beyond the scope of this paper, but suffice it to say the jury is still out on the future of the B-2. But Mr. Aspin does go on to say, ". . . I haven't seen anything in that briefing or anywhere else that makes me believe that anyone's found an "Achilles' heel" to the B-2's stealthiness."[52]

Ingrained in the controversy over the B-2, in addition to the heated discussions on its effectiveness, is the cost of the bomber system. The "... enormous costs. . . " of purchasing new bombers has gained much attention lately, as the U.S. attempts to determine its future security requirements.[53] The purchase of the weapons system is, however, just the tip of the iceberg for the bomber. The bomber force is also expensive to maintain once fielded, as it must be exercised often to ensure adequate training for its crews.[54] This use, of course, consumes resources, and causes equipment to fail and wear out. The high cost of the bomber system can be shown by the fact that the U.S. has spent 51.4 percent of its offensive strategic funding on the bomber over the last 10 years. This figure can be compared to 30.1 percent for the SLBMs and 18.5 percent for ICBMs.[55]

Another drawback for the bomber, also related to the need to exercise the system for training, is its vulnerability while

on the ground.[56] As the aircraft must be maintained, and safety and budget constraints caused the cessation of airborne alerts with live nuclear weapons, at any one time many of the bombers are not capable of being launched quickly in order to avoid a surprise attack.[57] Strategic Air Command plans authorize only up to 30 percent of the bomber force to be on ground alert at any one time.[58] This number would of course be raised in times of world tensions, but the 70 percent of the fleet being "sitting ducks" is cause for concern.[59,60]

A final argument against the bomber uses as its basis one of the strong points of the bomber--that it is the only system capable of performing search-and-destroy missions against "look and shoot" mobile/hardened Soviet targets.[61] This argument leads from the paradoxical deterrent verses threat arena, where putting more of an enemy's assets at risk is considered dangerous because their survivability reinforces deterrence.[62] The most compelling argument in this discussion concerns mobile/hardened command centers, as destroying these (the decapitation of the enemy), could in fact encourage the continuation of a conflict by not leaving a command authority in charge to call a halt to hostilities.[63].

THE INTERCONTINENTAL BALLISTIC MISSILES

As the second nuclear delivery system to enter the strategic scene, the Intercontinental Ballistic Missile (ICBM) also brings with it some unique advantages and disadvantages. Its past, like that of the bomber, has been filled with controversy and various opinions over the years as to its usefulness as a strategic deterrent. As discussed earlier, the ICBM has been improved upon numerous times in its history, but technological innovations do not in themselves determine the basic worth of a system. This chapter will, as with the bomber, discuss the pluses and minuses of the ICBM as a strategic system.

Before beginning the discussion, we will once again provide a definition of ICBMs. The following is what the SALT II documents say:

> 1. Intercontinental ballistic missile (ICBM) launchers are land-based launchers of ballistic missiles capable of a range in excess of the shortest distance between the northeastern border of the continental part of the territory of the United States of America and the northwestern border of the continental part of the territory of the Union of Soviet Socialist Republics, that is, a range in excess of 5,500 kilometers.[64]

Note that the SALT accords were interested in numbers of launchers, not actual missiles. But even with this, the definition is much more definite than the one offered for the "heavy bomber", as this definition sets a specific range and basing mode for the subject weapon. It therefore should make the job of the treaty negotiators and other interested parties easier.

Advantages of the ICBM

The major advantage the ICBM has over the other two legs of the triad is its "devastating accuracy".[65] This accuracy is what makes the ICBM the premier weapon for use against hardened Soviet targets, such as fixed land based missile silos.[66] The ICBM owes its accuracy advantage to the fact that it is a fixed system, thus it always "knows" exactly where it is, and if the coordinates of its intended target are likewise known and fixed, it can hit where desired.[67] The ICBMs increase the advantage afforded them by their accuracy with their ability to deliver a large amount of weight (throw weight) to the target area.[68]

The ICBMs also offer the national command authority its only real immediate response nuclear weapons delivery system. Because the ICBMs are located within the continental United States, their Command, Control, and Communication process is much better than the sea based SLBMs, and they can be launched

without any delay.[69] Their time of flight to their target is much less than the bombers, who would receive launch instructions at the same time as the ICBMs, but take much longer to deliver weapons.[70] This gives the ICBMs the prompt retaliatory capability needed to strike time-urgent targets in the Soviet Union such as airfields, nuclear storage areas, and other war making assets before they can be employed.[71]

The ICBMs offer another advantage, one that will become more important as the United States' defense budget shrinks. The land based missiles are by far the cheapest delivery system in the triad.[72] This economy does not, however, come at the expense of readiness, as the ICBMs have proven over the years that they can be maintained indefinitely at near 100 percent alert rates.[73] This combination of low cost and high availability comes from a number of factors. The missiles were designed to be highly reliable, and their storage in a controlled, non-moving/jarring environment contributes to their low maintenance requirement.[74] The ICBMs also do not have to be exercised to provide training for their crews, which eliminates the wear and tear the bombers and submarines must endure. Further on the human side, crews manning the ICBMs are rotated

on location, which, unlike the SLBMs, keeps the system on line at all times.[75]

The final advantage of the ICBM for discussion is a nebulous one, but one that enhances the worth of the system as a deterrent force. The ICBMs are the strategic weapon system the Soviet leaders seem to fear the most.[76] This respect for the weapon may be based on the theory that the thing the Soviet leadership values the most is itself, and they see the ICBMs as the largest threat to them in their hardened command facilities surrounded by air defense systems.[77] This view can further be supported by the fact that the Soviets have invested more on their own ICBM programs than on their bombers or SLBMs over the years, and indications from them that ICBMs are what they seem most anxious to limit in arms control agreements.[78,79]

Disadvantages of the ICBM

The ICBM is, however, not without its faults. Notwithstanding its having served to protect the security of the U.S. for over 30 years, its drawbacks, like those of the bomber have caused some to signal its demise and call for the elimination of the land based missile as a part of the triad.[80]

The general consensus is that the biggest drawback of the ICBM is its ever increasing vulnerability.[81] This disadvantage continues to grow as the Soviet Union develops more accurate

ICBMs of its own to target against the U.S. missiles.[82] The latest variation of the Soviet SS-18 ICBM, the Mod 5, with its improved accuracy and 10 multiple independently targetable re-entry vehicles (MIRVs) per missile, has placed the United States' Minuteman and Peacekeepers in even greater danger.[83] MIRVs are seen as the largest threat to the ICBM, for without MIRVs, the very best the Soviets could hope to accomplish with an attack on U.S. missiles is a one for one kill ratio.[84,85] In fact, the Department of Defense estimates that by using two warheads against every U.S. ICBM, the Soviets could achieve 65 to 80 percent destruction.[86] This makes the increase in MIRVed systems critical to the survivability of the ICBM.

The vulnerability of the ICBM evokes a double problem for the missile, because not only does its lack of survivability put it at jeopardy, in the paradoxical world of deterrence, it also makes it a destabilizing influence on the nuclear scene.[87] The rationale behind this line of thinking is that the missiles' vulnerability makes the owners of the missiles more likely to launch them at the first sign of trouble so their weapons are not destroyed in the ground.[88] This "launch on warning" as a counterforce attack philosophy, could start a nuclear exchange if the warning is false or if a system malfunction causes one

side or the other to lose its methods of detecting an attack.[89,90]

Another problem inherent in the design of the ICBM, and one that is considered critical by some, is that it is strictly a "fire and forget" weapon.[91] Once the missile is launched, it is on its way to the target, and nothing can be done about it. Unlike the bomber, there is no recalling an ICBM should the military or political situation change.[92] This fault of the ICBM is further compounded by what could be considered one of its assets--time to target. If used for a counterstrike against the Soviet Union, the speed of the ICBM, and the lack of ability to alter its mission, combine to produce a very dangerous weapon from a stability of the world viewpoint.[93]

THE SUBMARINE LAUNCHED BALLISTIC MISSILES

The submarine launched ballistic missile (SLBM), although the last member of the triad to join the trinity, has contributed much to the security of the U.S. The SLBM, like the bomber and ICBM, has come a long way since its introduction as a U.S. strategic nuclear delivery system in 1960.[94] The missiles themselves have been improved upon, both in range and accuracy, and their launch platforms, the submarines, have likewise been

advanced by technology. The purpose of this section will not be to discuss the submarine launch platform of the SLBMs, or the missile delivery system itself, as separate entities, but to examine the system as a whole.

As with the bomber and the ICBM, as a starting point to examine the SLBM, we will once again turn to the SALT II documents for a definition.

> Modern submarine launched ballistic missiles are: for the United States of America, missiles installed in all nuclear-powered submarines; for the Union of Soviet Socialist Republics, missiles of the type installed in nuclear-powered submarines made operational since 1965; and for both Parties, submarine-launched ballistic missiles first flight-tested since 1965 and installed in any submarine, regardless of its type.[95]

Note again that the SALT are concerned with launchers, not missiles. This definition differs from the vague bomber one that only addressed specific types of aircraft and the ICBM definition which listed specific ranges of weapons. The SLBM definition deals in the year the weapons were developed or tested, which gives it a much broader scope.

Advantages of the SLBM

The single, most overriding advantage the SLBM has over the other two members of the triad is its survivability.[96] The survivability of the SLBM is mainly due to its being virtually

undetectable by the Soviets when at sea.[97] In fact some have gone so far as to say:

> It is an accepted fact that American SSBNs [ballistic missile submarines] are so quiet . . . that detection is all but impossible. . . . there has not been one recorded instance of a successful tracking. . . .[98]

The ballistic missile submarine's ability to elude the Soviets is a function of two factors. The first is the commanding lead the U.S. enjoys in the technology required to make submarines extremely quiet.[99] The other half of the equation is the fact that the Soviets have not been able to develop a sonar system as sensitive as the United States'.[100] This lack of capability on the Soviet's part can certainly not be contributed to their lack of interest. A 1985 Central Intelligence Agency study identified 13 Soviet institutes engaged in anti-submarine warfare research.[101]

Another advantage the SLBM enjoys is that it is free to roam over virtually the entire planet underwater. This vast expanse, of some 40 million square miles, unencumbered by roads or other established routes, makes hunting the submarine a herculean task.[102] The vastness of the world's oceans also allows the SLBM to attack the Soviet Union from any direction. This complicates the defenses of the Soviets, for they must now

guard more than just the polar approaches the ICBMs and bombers would take during an attack.[103]

The SLBM also brings to the triad a unique stabilizing influence. Because of its invulnerability, it is virtually immune from a counterforce first strike.[104] While some of the submarines could undoubtedly be destroyed before they could launch their missiles, a coordinated attack to eliminate all of the deployed missile carriers would be impossible.[105] This capability, of course, is what deterrence is all about--to make the enemy think twice about a first strike, knowing the SLBMs would deliver a devastating counter strike.[106,107]

The final advantage of the SLBM to be discussed here is its relative low cost. While not as inexpensive to operate as an entire system as the non-moving, non-exercised ICBMs, the SLBM has been, on a warhead for warhead basis, the cheapest of the triad members.[108] The SLBM, with over 50 percent of the United States' nuclear warheads, only expends approximately 25 percent of the nation's strategic budget.[109]

Disadvantages of the SLBM

The most significant drawback of the SLBM as a nuclear deterrence force is the difficulty the national command authority has in communicating with the dispersed, submerged submarines.[110] In fact this concern has been referred to as the

". . . only one of major consequence. . . ".[111] While many do not agree that this is the only concern, the lack of reliable, real-time, two-way communication with a force carrying up to 50 percent of the nuclear warheads of the U.S. certainly makes the SLBM less responsive to the needs of the nation.[112]

The communication problem of the SLBM fleet is caused by two separate factors. The first is the fact that unlike the bombers and ICBMs, the submarines are continuously on the move. This, of course, means hard-line, wire communication with them is not possible, and necessitates the building of land based radio transmitters and antenna farms. These relatively soft facilities then become lucrative targets for an enemy first strike.[113] The second factor in the communication problem is that two-way communication in a crisis situation would be dangerous for the submarine. The submarine, unlike the hardened silo protected ICBM, relies entirely on its stealth to remain safe from attack. One radio transmission would reveal the submarine's location and invite a nuclear response from the enemy.[114]

Another serious disadvantage of the SLBM is its lack of accuracy.[115,116] The accuracy problem is inherent in the weapon system, because of the imprecision involved in determining the

exact location, speed, direction, and attitude of the launch platform.[117] The latest U.S. SLBM, the Trident II D-5, uses state of the art technology, including improved inertial guidance systems and signals from the Navstar Global Positioning System (GPS), to improve its accuracy.[118] These advances will give the SLBMs "some hard target capability", but their accuracy will not be equal to those of the modern, fixed based ICBMs.[119,120]

A third disadvantage of the SLBM is its lack of flexibility. This problem is compounded by the difficulty the national command authority has in communicating in real time to the submarines exactly what mission to accomplish when.[121] The SLBM's flexibility is also limited by the fact that all of the missiles have multiple independently targetable re-entry vehicle (MIRV) war heads, which do not lend themselves well to striking smaller targets.[122] The submarine's use of stealth as its only means of survival also adds to the flexibility problem. If the submarine fires just one missile, it reveals its location, and invites a counter attack.[123] Thus the submarine has a survival incentive to launch all of its weapons to do the most damage to the enemy possible before it is located.[124]

The final disadvantage of the SLBM to be discussed is its lack of availability. The submarine is a complicated piece of

machinery, and as mentioned earlier, must be exercised, both to keep crews trained, and for the protection of the weapon system. This generates the necessity for periodic maintenance and repair, and crew rest, which means time in port where the submarine is a "sitting duck" in case of an attack.[125] Currently, approximately 60 percent of the United States' submarines are at sea roaming within striking distance of their targets, the other 40 percent are either in port or in transient to or from port.[126]

ANALYSIS/CONCLUSIONS

In this, the final section of the paper, we will analyze the data presented earlier in the document to understand the strengths and weaknesses of the weapons systems, and the way they interact to compensate for shortfalls of other systems. We will then offer some conclusions based on the analysis concerning the future of the triad system of strategic defense, and its continued worth to provide for the security of the U.S. in a rapidly changing world.

Analysis

To examine the elements of the triad and their relationships, we will compare the capabilities and limitations

of the three weapons systems to a list of some of the generally agreed upon characteristics that strategic nuclear weapons systems should possess to be of benefit as a deterrent. The list was compiled from several sources, and is thought to best represent qualities these weapons should have.[127]

Survivability: The ability of at least a portion of a strategic system to continue to exist after an enemy attack is the most important quality it must possess to be a viable deterrent. In this category the SLBM reins supreme. With its stealthiness and vast oceans, it is virtually 100 percent survivable when deployed. The almost assured survivability of the SLBMs compensate for the limited capability of the bombers and especially the ICBMs in this area. Mutual support is also a valuable force multiplier here, in that the mere fact that three diverse delivery systems exist, causes the Soviet Union to dilute its efforts to thwart them.

Flexibility: To be totally optimized as a deterrent, a strategic weapons system must afford the national command authority infinite options for its use. These options must include not only targeting choices, but the ability to tailor responses to support the national will. The bomber, with its recallability, retargetability, reusability, and options of

weapons loads, comes very close to achieving 100 percent of this requirement. The missile based systems are quite constrained in the amount of flexibility they can provide as a function of their design, but their deficits are well compensated for by the bombers.

Responsiveness: A strategic weapon must be able to react to the desires of the national command authority without delay. To accomplish this, it must have reliable two-way communication with higher authorities, be able to react quickly, and be extremely reliable if called upon. The ICBMs fulfill all three requirements better than any other system. The bombers fall short on the reaction time requirement, as they are extremely slow on the way to a target. The SLBMs, by the nature of their method of deployment, suffer from a lack of reliable, timely two-way communication.

Lethality: A strategic weapon will not be a viable deterrent if it is not considered capable of causing extreme damage to a potential enemy. To be considered lethal a system must first, with a high degree of certainty, be able to penetrate the enemy's defenses on the way to the target. Once at the target, it must then be able to accurately deliver a large payload. The ICBMs possess more lethality traits than the other two systems. The ICBM's penetration ability is virtually

assured, until such time as anti-ballistic missile systems become technically and fiscally feasible, and its accuracy and warhead yield are unmatched. The bomber, on the other hand, has questionable penetration ability as the Soviets continue to develop their already formidable air defense systems. The SLBM's current and future accuracy is not expected to match that of the ICBM.

Cost Effectiveness: While not a strategic characteristic, the current and predicted economic situation, and the rapidly changing face of the world, make the cost of any system a major factor in its perceived usefulness. The cost of strategic weapons can be determined in several ways, but as a function of an entire system, the ICBM remains the least expensive of the three. The bomber is a costly system to operate and maintain because it must be operated and maintained often to retain its potential. Likewise the SLBMs must be on the move, and they, like the bombers, are constant consumers of material and manpower.

Conclusions

To reach conclusions concerning the viability of the triad in the 1990s, two simple questions with no simple answers must be addressed. The most basic of the questions is: Does the

U.S. require a nuclear deterrence? If the answer to this first question is yes, the second question is: Does the nuclear deterrence have to be in the form of a triad of bombers, ICBMs, and SLBMs? The short answer to both questions is yes.

The long answer to the question of whether the U.S. still requires a nuclear deterrent force is, by some, that with the fall of communism and the end of the cold war, the U.S. no longer requires nuclear weapons for its security. This desire to do away with all nuclear weapons is countered by those who maintain that the U.S. must carefully balance its defensive reduction actions with the still real threat to its security from numerous areas.

Ambassador Rowny aptly stated the case for continued vigilance: "Resting our security on politics in flux and personalities would be to build a castle on shifting sands."[128] The Ambassador was obviously directing his comments toward the rapidly evolving political upheaval within the Soviet Union, and toward Mr. Gorbachev's charismatic leadership style. His point is well taken by many who continue to detect threats to the U.S. from the chaotic crumbling within what is left of the Soviet Union. As the economy of the Soviet Union continues to decay, and Mr. Gorbachev continues to become more and more unpopular with his own people, the very real possibility exists that he

may not be in power next year. Who would take his place, and whether the Soviets would continue with glasnost and perestroika becomes anyone's bet--a bet the U.S. should not stake its future on by doing away with the weapons that won the longest, potentially most dangerous war ever--the cold war. One must remember that many of the Soviet Union's missiles are still pointed at the U.S., and even as the Soviet's Union disintegrates economically, more modern missiles and bombers are being fielded.

The second question then comes to be: Should the nuclear arsenal of the United States be in the form of the traditional triad? Again there are many who, while seeing a requirement for a nuclear deterrent, feel an adequate deterrence could be maintained more efficiently without all three legs of the triad. Those opposed to the triad use all of the strengths and weaknesses of the three legs discussed earlier in this paper to expound upon theories designed to eliminate one leg or the other. The arguments are for any of a variety of reasons, varying from cost, to a system being a destabilizing influence, and are generally leveled against a particular weapons system by proponents of one of the others.

The champions of the triad reply that it has proven to be a viable division of U.S. strategic forces for over 30 years for a number of good reasons. It increases the difficulties of an enemy's defensive efforts by presenting three unique methods of delivering strategic weapons, it compounds the enemy's targeting problems, it removes the potential of a technical malfunction or breakthrough negating the entire strategic deterrence effort, and it allows the national command authority greater flexibility in dealing with world-wide situations.

Both sides of the discussion are equally sincere in their beliefs, but the conclusion of this paper is that the triad is a viable entity upon which the U.S. should continue to base its security into the 1990s. The reason for this position is the fact that the triad strategy won the cold war, but a real threat to the U.S. still exists. What makes the triad the invincible system it is remains the inherent ability it possesses for each leg to cover any weakness of the others. This unique blending results in a synergistic relationship among the legs, in that the total security provided is much more that just the sum of the parts of the trio. To eliminate any one of the members of the triad would be to so weaken the system as to put the future security of the U.S. in jeopardy.

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c.) The Department of Military Strategy, Planning and Operations, U.S. Army War College, Reference Text, Forces/Capabilities Handbook, Volume I, Organizations, Academic Year 1991, p. 8-1, which said, ". . . they must possess certain characteristics: Survivability. . . Penetrative Ability. . . Striking Power. . . Reconnaissance Capability. . . Flexibility. . . Reliability. . . Survivable C^3I. . . Endurance. . . ."

These lists were reviewed, analyzed, condensed, and expanded to form the list used in the paper.

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